

REMARKS

Claims 1, 3-5, and 16-19 are presently pending for the Examiner's review and consideration, and claims 6-15 have been withdrawn from consideration, but depend from claim 1, which is being examined. Claims 1, 3, and 16 are presently amended, claim 2 is canceled without prejudice, and new claim 19 is added.

Claims 1, 3-5, and 16-19 are presently pending in the application. Claims 6-13 have been withdrawn, although claims 11 and 12 have also been amended to more particularly define the invention under 35 U.S.C. § 112, second paragraph. Additionally, claims 2, 7, 10, 14 and 15 have been canceled without prejudice, and the right is reserved to present these claims again in future prosecution. Claims 1, 3, 16, 18, and 19 have been amended under section 112, second paragraph. The amendments to claims 18 and 19 correct a typographical error. New claims 20-25 have been added, and are supported in the originally filed specification and drawings. As discussed below, one of ordinary skill in the art at the time of filing would have understood based on the disclosure, that the length to diameter ratio of the channel is the ratio of length to the average diameter over the length. The drawings show a channel with a substantially constant diameter that equals the diameter of the orifice, supporting claims 21 and 22. The recitations of claims 24 and 25 are supported on pages 8 and 9 of the application.

In the Office Action, the double patenting rejection was maintained with the argument that although the Applicant has elected a different patentably distinct species than in the 6,309,371 patent, the claims are allegedly broader in scope than the claims of the '371 patent. This, however, is not accurate, since while the claims of the application and the '371 patent claims cover overlapping scopes, one set of claims is not broader in all respects than the other. Claims 1, 16, and new claim 20 of the present application, which are the independent claims, each recite a length to diameter ratio of the discharge channel as being greater than 6/1. On the other hand, claim 1 of the '371 patent does not include such a recitation. At least in this respect, the presently presented claims are narrower than the claims in the '371 patent, and the double patenting rejection is thus again requested to be withdrawn.

With respect to the claims that have been withdrawn from consideration, namely claims 6-15, these are all dependent on claim 1. Consequently, these claims would not need to be canceled if claim 1 is allowed.

Claims 1, 3-5, and 16-17 were rejected under 35 U.S.C. § 102(e) as anticipated by the Lilley patent. Also, claim 18 was rejected under 35 U.S.C. § 103(a) as obvious over the Lilley patent.

With respect to the section 102 rejection, the Examiner argued that Figs. 10 and 11 of the Lilley patent disclose the length of the discharge tube with a taper, citing elements 24 and 28. The Office Action argues that since orifice 24 is “very small,” it would be considered to be clearly shown that the length of the channel to the diameter of the orifice is greater than 6/1.

Claim 1 defines that the discharge channel has a length to diameter ratio of greater than 6/1. Claim 16 also defines this ratio and further defines that the channel and orifice have the “diameter”. The amendments to these claims clarify that the diameter referred to is the diameter of the channel, and not necessarily of the orifice, that is measured in the ratio.

As seen in the drawings of the application, such as in Figs. 2-4, 7, 10-14, 16, 17, and 19-21, the discharge channel has a portion that is consistently narrow that leads to the orifice. In each of these embodiments, the portion of the channel with the small diameter has a length that is more than six times the diameter. This is not the case, conversely, in Figs. 10 and 11 of the Lilley patent. When measured, no portion of those drawings show any length of the outlet portion of the channel that is six times as long as the channel diameter. In fact, although the orifice may be small, in Fig. 10 it is clear that the channel length is about the same as the orifice diameter. Behind the narrow portion in Fig. 10 is a sharp step, followed by a widely tapered portion, the diameter of which is much too large to satisfy the 6/1 ratio. Similarly, in Fig. 11, the narrow portion of the channel is fairly short, and behind that, the channel rapidly widens to match the diameter of the ampoule chamber 26. No portion of the channel of Fig. 11 can be measured with a length that is greater than six times its diameter.

In the case of the changing and tapered diameters of the channels, one of ordinary skill in the art would understand that such a measurement is based on the average channel diameter over the length at which it is measured. As explained in the description of the embodiment of Fig. 21 in the application, the region in which the length to diameter ratio is greater than 6/1 is followed by a long and gradual approach angle 91, which corresponds to the tapered section that leads to the fluid chamber 26. (Application, p. 8.) It would thus be clear to one of ordinary skill in the art that the channel in which the 6/1 ratio exists does not

include the long and wide tapered portion that expands to the size of the ampoule chamber 26 of the Lilley patent.

New claim 20 corresponds to the elected species and further defines that the average length to diameter ratio of the channel adjacent the orifice is greater than 6/1 to reduce the force requirement of the energy source to jet inject the fluid. As explained above, one of ordinary skill in the art would have understood that such a length to diameter measurement of the channel is the ratio of the average diameter along the length over which the ratio is measured, in order to obtain the advantages described on page 9 of the application. This is explicitly defined in claim 20, and is clearly different than what is disclosed in the Lilley patent.

Additionally, claim 21 further defines that the channel diameter is substantially equal to the orifice diameter adjacent thereto, which is where the ratio is measured. Claim 22 further defines that the channel has a constant diameter where the length to diameter ratio is measured. While the channel of Fig. 10 of the Lilley patent has the constant diameter adjacent the orifice, the ratio of length to diameter is very close to 1/1, which is much lower than the claimed ratio. Additionally, Fig. 11 of the Lilley patent shows a very short constant diameter portion, the length of which is much less than six times its diameter. This portion is followed by a tapered portion which rapidly widens long before the length is at least six times the average diameter thereof.

As explained in the previous amendment, using a discharge channel with a length to diameter ratio of at least 6/1 has been surprisingly found to allow the use of significantly lower forces applied to the mechanism that fires the jet, without resulting in a reduction in pressure when the jet is fired. This advantage is surprising and unexpected in view of Lilley. As shown in Fig. 18 and discussed on pages 8 and 9 of the application, a 40 lb. energy source has been used to produce a similar injection with the claimed channel ratio as can be accomplished with a 55 lb. energy source that uses a traditional probe.

Moreover, the Office Action's assertion that since the orifice of the Lilley patent is very small, "it is considered to be clearly shown that the length of the channel to the diameter of the orifice is greater than 6/1," is unfounded. The Office Action treats such a ratio as being inherent in the disclosure of Lilley, but this is not the case. As described above, the ratio that is actually shown in the figures is far greater than 6/1, and as explained numerous times in the application by the inventors, traditional ratios of length to diameter are much smaller than 6/1. Consequently, it is believed to be improper to merely consider that

the ratio is as claimed, when this feature is neither inherent nor disclosed, and certainly not suggested by the reference.

Highlighting the preferred embodiments, which take advantage of the benefits provided by the high length-to-diameter ratio, claim 24 recites that the steady state pressure produced is less than 4000 psi, and claim 25 further recites that the energy source produces up to around 40 lbs. to inject the fluid. This is also supported on pages 8 and 9 of the application, and this pressure and force to produce such pressure are not obtainable with prior art nozzles. (See application, pp. 8 and 9.) These claims are also thus novel and non-obvious over the art of record.

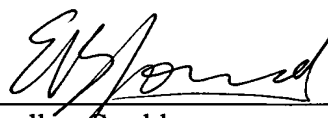
With regard to claims 18, 19, and 23, which recite even larger length to diameter ratios, there is clearly no suggestion of increasing the ratio so much further than disclosed in Lilley based on any of the references, especially since increasing this ratio is far more difficult to achieve when molding a nozzle, and the advantages provided by such increased ratio have not been foreseen or suggested in the prior art. Thus, there is no suggestion or motivation to increase the ratio to anywhere near the claims ranges. It is noted that claim 19 was not rejected in the office action, and corresponds also to the elected species.

All of the substantive patentability issues regarding prior art are believed to be presently overcome. Should any issues remain, a personal or telephone interview is respectfully requested to expedite the allowance of the application. No fees are believed to be due for this amendment. Should any fees be required, please charge such fees to Winston & Strawn LLP Deposit Account No. 50-1814.

Respectfully submitted,

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Date



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